D O W 4

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CONGRATULATIONS!

You are now the owner of a new, Dow-4 aircraft. This is a modern, 4-place sing. engine, high performance airplane designe. for business and pleasure. Manufactured by the Dow Aircraft Company, it is known as the Dow Gazelle when equipped with full instrument panel, plush upholstery, and wheel fairings.

Familiarize yourself with the contents of this manual to ensure hours of safe, pleasurable, and efficient flying.

GETTING STARTED

1) Load the program from cassette.
2) Run it. (The program is large. The first 2 steps will take several minutes
3) Select choice "1" from the menu when it appears. This is a take-off.
4) Specify "0" for both wind and chop.
5) After a few seconds the instrument panel will appear. The airplane is sitting on the runway, ready for take-off.
6) Read INSTRUMENTATION AND CONTROLS while you are sitting in the cockpit with the panel before you.
7) Hold down the E key (alpha lock up) to return to the menu.
8) Turn to THE BASICS OF FLYING. Follow the instructions and learn to fly in an easy, step by step sequence.

PRELIMINARY INSTRUCTIONS

If you own the TI-99/4A (not the older 99/4) and do not have a disk drive connected to your computer, you may skip this page entirely.

If you own the TI/99/4 (old) model computer, disregard comments about the alpha lock key and change statements 3680 and 3710 to be:

CALL KEY(0,K,A)

Save changed program on side B of tape.

If you own a disk drive (or peripheral expansion box with disk drive), it must be turned off unless you make the following changes...

You must modify the program as follows to load and run it from disk. It will then run about 30% slower. Turn on drive, turn on console, select Basic. Type CALL FILES(1), then type NEW. Load the program from cassette.

Delete statements 440 and 450.

Replace statement 110 with:

```
110 DIM FUEL(2),SV(18),CSV(18)
```

Insert

```
111 DEF AV(0)=ASC(SEG$(AV$,INT(0+.5)+1
                -40*INT((0+.5)/40),1))
```

Replace statement 430 with:

```
430 AV$=AV$&CHR$(A+120)
```

Delete 440 and 450.

Then type SAVE DSK1.DOW4

To run from disk: turn on drive, turn on console, select Basic, type CALL FILES(1), type NEW, load the program with OLD DSK1.DOW4, and type RUN.

OPERATING INSTRUCTIONS

PREFLIGHT CHECK LIST
TI99/4A Home Computer on and running smoothly
Program loaded
Alpha lock off
Joystick operating freely

TAKE OFF - NORMAL
Full throttle
Pitch - 5
Pull back at 60 mph for lift off
After climbing to a safe altitude (500 ft),
  push stick forward to obtain 110 mph,
  set trim
Climb out at 110 mph

TAKE OFF - SHORT FIELD
Full throttle
Pitch - 5
Flaps down at 70 mph
Climb at 70 mph until clear of obstacle
Push stick forward to obtain 90 mph before
  raising flaps, then immediately pull back
  to continue climb with flaps raised
Push stick forward to obtain 110 mph,
  set trim
Climb out at 110 mph

CRUISE
Below 9000 ft, 75% power
Above 9000 ft, full throttle

LANDING - NORMAL
Fuel selector to fuller tank
Trim for 80 mph

LANDING - SHORT FIELD
Fuel selector to fuller tank
Trim for 70 mph with flaps down

PERFORMANCE FIGURES

Speeds			
Never exceed	200	mph	
Top speed (sea level)	174		
Cruise (75%, 9000 ft)	169		
Maneuvering speed	129		
Maximum flap extension	100		
Climb			
Best rate (sea level)	112	mph	900 fpm
Best angle (sea level)	89		800
Glide			
Best L/D 10.2	92	mph	760 fpm
Ceilings			
Service	16,400	ft	
Absolute	18,000		
Stalls			
Flaps up	67	mph	
Warning horn and light	76		
Flaps down	58		
Warning horn and light	65		

CONTROL SUMMARY

Joystick - pitch and bank
1-9 - joystick pitch effectiveness (stick force)
A - abort approach or take off and go to full power
B - back to airport for ILS approach
C - climb - increase power
D - descend - decrease power
E - exit - return to menu
F - flaps - raise or lower
G - gas - select other tank
H - hold pitch (trim setting)
I - invert nav bearing - 090 or 270 deg
J - jam - pilot in jam, stop everything
K - keep on going (see J)
L - leveler - wing leveler on or off

CAUSES FOR CRASHES

MISSED RUNWAY
Descending to ground level off the runway surface or at too great an angle to the runway alignment (090 or 270 ± 18 deg)

TOTAL WIPEOUT
Impact with ground at high rate of descent.

LOST CONTROL
Going over 100 mph on the ground (takeoff or landing) or wing tip hits ground during landing due to excessive angle of bank.

TOO HARD
Touched down on runway but too hard. Max safe rate of descent is 300 fpm. Beware of inherent lag in VS indicator.

LOST FLAPS
Extending flaps over 100 mph causes severe structural damage.

LOST WINGS
Pulling more than 3.8 G's may cause wing failure. (See "maneuvering speed".)

LOST TAIL
Exceeding 200 mph may cause severe vibration of tail surfaces, causing structural failure.

TOO LOW
Hit TV transmitter tower, mountain, building, or other obstruction or terrain during ILS approach. Happens when off course, when too low before intercepting glide slope, when going too far below glide slope, or going below decision height or crossing the runway threshold while still in clouds.

INSTRUMENTATION AND CONTROLS

When reading this section you should either have the panel in front of you (on your monitor or TV screen) or else you should refer to Figure 1 as you read about each instrument.

Lights that are on are represented by a red circle; lights that are off are represented by a smaller, white circle. On all dials, a pointer is represented by a dot in the center and a dot at the end. If there are two dots at the end, the end of the pointer is at their midpoint. The pilot controls the plane with the joystick, the digits 1-9, and the lower case letters A-L.

STALL - This indicator light comes on at the same time a horn does; both warn you that the airspeed is getting dangerously low. If the stall actually occurs, the horn becomes more shrill and the nose of the plane falls rapidly. If you do not recover promptly, the plane will go into a steep dive.

A stall will occur at higher than normal speeds if in a steep turn.

Aircraft registration number - This is posted to the right of the stall warning indicator. This number is used in all radio communications and in filing a flight plan with a Flight Service Station. Read TI994A as Tango India Niner Niner Four Alpha. Frequently the air traffic controllers will abbreviate this to Niner Four Alpha.

VS - Vertical speed. This rate instrument shows how fast the airplane is climbing or descending. Due to the way this instrument is constructed, there is a delay before its reading is accurate. Therefore it should be used to determine the rate only after it has been established. When the needle is pointing to the left, the rate of climb is 0 feet per minute (fpm). When pointing up, the rate is 500fpm up. When pointing down, it is 500 fpm down. Each tick mark represents 200 fpm.

PITCH - Pitch effectiveness. This digit reminds you what effectiveness you have selected. It corresponds to how far and how hard you move the yoke in a real plane. A value of 1 is less effective than 9. The initial value is 4. Use smaller values at high speeds, higher values at low speeds. Full stick movement is a 9. Caution: for values 6-9 it is possible to stall so abruptly that the stall warning indicator does not go on before the actual stall.

GAS - Fuel gauges. The left gauge is for the left tank (in the left wing), the right gauge is for the right tank. Initially the left tank is selected. If a fuel tank runs dry, the engine will cut out. You must select the other tank and bring back the desired power setting. If one tank has more fuel than the other, the plane will tend to turn toward the heavier side. Each tank holds enough fuel for 1 hour at 75% power.

TACH - Tachometer. This does not actually show revolutions per minute (rpm's) but shows percent power. Up is 0 or 100%, right is 25%, down 50%, left 75%. Each tick mark is 10%.

FLAPS - Indicator lights showing whether the flaps are up or down.

JOYSTICK - Controls aircraft attitude.
Push forward - nose down.
Pull back - nose up.
To right - bank to right.
To left - bank to left.
Nose up and down (pitch) is also affected by the pitch effectiveness setting. The degree of banking is dependent on how long the stick is held to either side. The plane banks 9 degrees for each second the stick is held to the side. The maximum angle of bank is 63 degrees.

KEYS - Depressing several keys select options and control various functions of the airplane.

A Aborts landing or approach. If ILS approach, NAV switches from ILS to VOR mode and the clouds disappear. In all cases, full power is applied immediately.
B Back to airport for ILS approach. This can only be selected if east of the outer marker. A cloud cover suddenly materializes, obscuring the ground.
C Climb - power is increased, 5% the first second the key is depressed, an additional 10% the next second, 15% the next, and so forth.
D Descend - power is decreased, 5%, 10%, and so on, same as C.
E Exit from flying, go back to menu.
F Flaps are raised or lowered. Do not lower flaps when speed is above 100 mph. Beware of sudden loss of lift when raising flaps.

G Gas tank is selected. Caution: if a tank is run dry, the engine will stop. If one tank has more fuel than the other, the aircraft will tend to turn toward the heavier side.

H Hold trim setting at current pitch position. After the key is pressed, a low tone will sound. At the tone, release the stick and key both to hold that pitch position indefinitely. Subsequent stick movements are in addition to the held position. Trim settings can be accumulated by holding the key and stick for several seconds.

I Invert the NAV bearing from 270 to 090 or vice versa. Although the number changes, for ILS mode the needle display is not affected.

J The pilot is in a jam and needs to "stop the passage of time" momentarily. This can be used to study the manual and instruments, to go to the refrigerator, or to explain to your parents or spouse why you are playing with the computer all day.

K Keep on going. Restarts time after J key was used.

L Wing leveler. When on, the aircraft rolls to wings level position and maintains it. If the stick is used to bank, the plane will return to level as soon as the stick is released. The wing leveler will keep the plane level even though the fuel tanks are uneven, and will return it to level in severe turbulence.

Figure 1 shows: 85mph, nose down, banking and turning to right, heading 90 deg, descending through 3500 ft, 60% power, flaps up, and south of 270 course to VOR station.

OPTIONS

1) TAKE OFF
The aircraft is positioned at the starting position for a take off roll on runway 27 (that is, heading 270). The airport is at sea level.

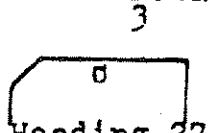
2) IN FLIGHT
You are asked to specify altitude in feet above sea level at which the plane should start, the ground level (also above sea level), and the starting velocity. The power and trim are automatically set to maintain level flight at that speed and altitude. If the altitude is too high, there may not be enough power to maintain level flight at the specified speed. If the altitude is the same as the ground level, you can try taking off from an airport above sea level. The starting direction is selected randomly. The starting position is selected randomly within 5 miles of the primary airport (where the VOR and ILS are located); if you are trying a high altitude take off, you are at a secondary airport from which you can take off but not land.

3) LANDING
You are about to join the down wind leg for a landing on runway 27. See Figure 3. You are heading 045° at an altitude of 1000 ft above sea level at 130 mph. The airport is at sea level and your location is about 1 mile south west of the touch down point. For the landing to be safe, you must touch down on the runway surface and

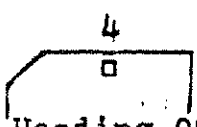
be able to stop within the overrun. This means that the touch down must be within a mile of the threshold. When within several miles of the field, a digit appears on the screen above the panel. The value of the digit and its height above the panel represent the distance to the touchdown point (the east end of the runway). This distance is in the East-West dimension only; it is not affected by being North or South of the touchdown point. Examples:

"4" just above panel = .4 miles east or wes
"8" just above panel = .8 miles east or wes
"2" one row higher =1.2 miles east or wes
"9" two rows above it=2.9 miles east or wes

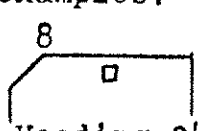
If the digit is exactly above the stall warning light, you are exactly in line with the runway. This is true even if you are not heading 090 or 270. The display makes sense if you imagine turning your head to due east or due west, whichever is closer to your heading. Then, if the digit is to the right of the screen, picture the runway to your right (with your head correctly aligned). Of course, when about to touch-down, the plane should be aligned closely to the runway so then the digit is easy to understand. Here are some examples:



Heading 270
TDP 1.3 mi
and to right



Heading 090
TDP .4 mi
straight
ahead or be-
hind



Heading 045
TDP .8 mi
east and
about .8
miles north

(TDP = touch
down point)

When you are 1 mile north or south, the digit will reach the limit of its travel to the side of the panel, even if you

get as far as 3 miles away.

4) SHORT FIELD LANDING
You are positioned for a landing just as for option 3. The only difference is that there is now a ridge 400 feet high (above sea level) just ⅓ mile east of the runway. In other words, if you descend below 400 feet when farther east, you buy the farm. Furthermore, the runway is shorter, so you must be on the ground within ½ mile of the threshold.

5) ILS APPROACH
The letters ILS stand for Instrument Landing System. (See Fig. 2) An ILS has certain equipment on the ground and in the aircraft which together with exact procedures define a safe method of landing at an airport even if visibility is poor or the ceiling (cloud bottoms) is low. The value of the ILS approach is that it locates the airplane precisely in space relative to the runway threshold. At this airport, if you break through the clouds at the decision height (DH), which is only 300 feet above the ground, you will be just 1 mile from the runway and in a position to "make a landing of it" (if you are in practice). This approach can be selected with the key B, provided you are east of the outer marker. (A) If you choose option 5, you will automatically be positioned 8 or so miles east of the airport and within 1 or 2 miles north or south of the center line. You will be at an altitude of 2000 feet, heading west, at 140 mph. The ceiling is not

known; it is probably above the 300 ft DH, but it may be below it. (B) Your first task is to turn as necessary to center the needle. You should also slow down to a more reasonable approach speed, since you could not make a landing at 140 mph when you break through the clouds at about 300 ft and a mile out. It is too difficult to slow down during the actual approach. Do not go below 1200 feet until past the outer marker! (C) As you approach the outer marker, located 4.2 miles east of the runway, the outer marker light will go on. Once past the transmitter the light will go out. (The transmitter sends a fan shaped signal straight up from the ground.) At this time you should be established on the glide slope; that is, the glide slope needle on the left side of the NAV display should be centered. (D) Now concentrate on keeping both needles as close to the center as you can. If things get out of control, call "missed approach" on the radio and execute the missed approach procedure; abort the approach and apply full power (A key), climb straight ahead to 1500 ft, then climbing right turn to 2000 ft, heading 090. (E) The middle marker is 1.5 miles out. Its light will not stay on as long because you are closer to the transmitter on the ground. Your altitude passing over it should be 450 feet. (F) You could break into the clear at any moment. You must not go below 300 feet in the clouds. If in the clouds still at 300 feet you must call missed approach. (G) The signal to you that you are below the clouds will be the ILS light on the

TURNING

To make a shallow or slow turn, select the IN FLIGHT option with ALT 1000 ft and GL at 0 ft. Start with V equal to 100. (When practicing, always set wind and chop to 0.) Then follow these steps:

1) Hold the stick to the right for 1-2 sec.
2) The AH now shows wings banked to the right.
3) TURN shows turn to right.
4) DG slowly turns clockwise as plane does.
5) To stop the turn, hold stick to left until AH shows wings are level.
6) TURN is now straight up (no turn).
7) DG is no longer turning.

Try a turn to the left also. Then try it at a higher speed (eg 150 mph) and a lower speed (eg 80 mph). (Use the E key to return to the menu to start at a different V.) Notice that for the same degree of bank, the rate of turn is greater when V is lower.

Practice turning to a particular heading (eg North), trying to stop exactly at the heading without turning too far or too little.

DESCENDING

Set up the plane as above, with V at 100.

1) Hold down the D key for about 3 seconds.
2) Listen as the power is reduced.
3) Also notice the TACH change.
4) Because power has been reduced, the plane initially slows down a little as drag continues to pull on it. As the plane slows down, the wings produce a little less lift. This causes the nose to drop a little. Because the nose went down, the plane is now "coasting downhill". Going down hill brings its speed

back to its original value. Because the plane was trimmed for this value, the plane stabilizes at a constant speed in a descent. All of this only takes a few seconds.

5) The VS dial now shows the rate of descent. (Allow several more seconds for it to reach its final position.)
6) The ALTimeter will now be unwinding.

Try it again, but reduce the power all the way to 0%. The initial drop in airspeed will be more clearly seen, and the final rate of descent will be faster. Also try descents starting from different initial values of V.

CLIMBING

This is exactly the reverse of descending. Start in level flight again, but increase power this time. The engine noise will increase in frequency and volume, the TACH will show the increase, the speed will initially increase followed by a climb, the VS dial will show the climb, and the altimeter will show the gain.

SOME THEORY

In order to use the stick (elevator), you should understand the role that lift plays for your airplane. Lift is the term used to refer to the forces acting on the wing that enable the plane to stay up. When you go out on a windy day, you feel the force of moving air very directly. The wings on your plane are shaped to take advantage of this force. They control and direct the force to keep the plane aloft.

Here is an experiment to try, if you haven't already at some time. Make your hand flat and stick it out the window of a moving car. If your hand is perpendicular to the air flow, you simply feel a lot of resistance. If you hold it level, there is little resistance. Now, tilt it back some from the level. You can feel a force that lifts your hand. This is just what an airplane wing or helicopter rotor blade or bird wing does.

There are two important things to notice from this experiment.

1) The faster the car goes, the greater the force on your hand.
2) The more you tilt your hand back, the more lifting force you feel. (Until you tilt it so far that you feel no lift at all.)

Pulling back on the stick in the airplane is the same as tilting your hand back. It actually tilts the plane back, and with the plane go the wings also.

One more fact: if the plane is not turning and if it is in equilibrium (that is, not speeding up or slowing down), the lift produced by the wings is exactly equal to the weight of the plane.*

Now to put all this together into practical terms. To maintain level flight, if the plane slows down the nose must come up; hence you must pull back on the stick. Similarly, if the plane speeds up, you must push on the stick to put the nose down to maintain level flight. You will probably

* Actually, the vertical component of the lift equals the weight of the plane.

have to hold down the H key or increase the pitch effectiveness to make the nose drop enough to get flying again.)

To really see the effect of a stall, do not let the plane recover for a number of seconds. Watch the air speed rise and the altimeter "unwind." Recovery will be difficult if not impossible if the speed builds up too high. You have to put the nose down to recover from the stall, but once recovered there is the danger of exceeding the 200 mph upper limit, causing the tail surfaces to break off. But if you try to recover from the dive too fast you can pull the wings off by exceeding 3.8 G's and you can even go into another stall.

Stalls should be avoided. If one occurs, push the nose down and recover as soon as possible. NO MATTER HOW CLOSE TO THE GROUND, IF A STALL OCCURS YOU MUST PUT THE NOSE DOWN.

Obviously if you stall close to the ground there is no chance of recovery unless you act immediately. Therefore, when landing be very careful with airspeed and stick force (pitch effectiveness). If landing in rough air, play it safe and keep the speed a little higher.

Once you have determined where you are (eg northeast), turn to fly toward the extended runway (eg south). Watch the needle; as it begins to center, turn 90° toward the VOR (eg west).

Once positioned on or close to the extended runway, and heading roughly 090 or 270, make small corrections in course to keep the needle centered. IMPORTANT: Do not keep turning toward the needle until it centers. Instead, turn until the DG indicates that you are on a course which will intercept the extended runway, then hold that heading until the needle centers. Do not intercept it at more than 30° intercept angle or you will fly across the selected bearing and have to approach it from the other side.

To summarize tracking, if the needle is to one side, try turning a few degrees to that side, then hold the heading until the needle centers. If it does not move, try a few more degrees.

When tracking with a wind, the heading which will keep you on course may be a little different than 090 or 270. If so, you are crabbing. Simply experiment, making corrections of a few degrees at a time, until you keep the needle from moving.

When making an ILS approach, use the same technique as for tracking with the VOR. However, remember that the ILS needle is far more sensitive than the needle is in VOR mode. Also, although the I key will change the bearing display (090 vs 270), the to/from indicator will not change and the needle will not change because the ILS is always 270°.

CHALLENGES FOR THE ADVANCED PILOT

STEEP TURNS - Try making two complete circles at 60° bank, rolling out at the same heading that you started at. Do not gain or lose more than 100 feet of altitude.

TIMED CLIMBS AND DESCENTS - Use a stop watch to see if you can climb or descend 1000 feet in exactly 2 minutes, or 500 feet in 1 minute.

TIMED TURNS - Try turning 360° in exactly 1 minute or exactly 2 minutes. (When flying under instrument conditions, the 2 minute turn is standard.)

TIMED CLIMBING OR DESCENDING TURNS - Try to climb or descend 500 feet while turning 180° in exactly 1 minute.

PARTIAL PANEL - Cover one of the instruments, then see if you can do the above maneuvers or fly an approach, etc. For instance, cover the AH or DG. This will demonstrate the extent to which the various instruments provide similar information to the pilot. Although none is exactly like another, there is enough redundancy that you can fly even though one of the instruments has failed.

HOLDING PATTERN - Figure 5 shows how to fly a holding pattern. Once you can do it, try it with a strong wind.

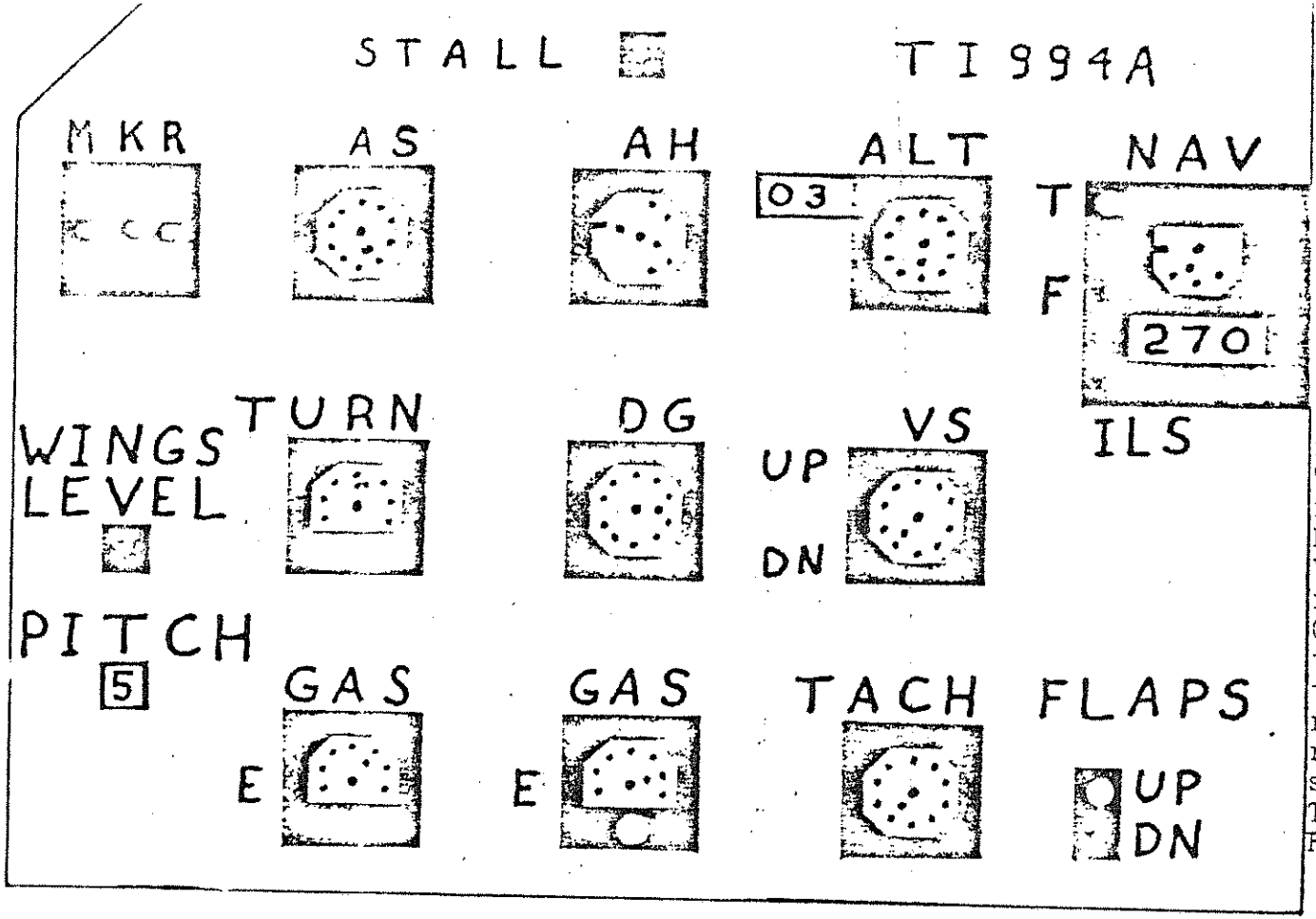
ACCELERATED STALLS - Put the airplane into a steep turn, then stall it. Notice that it stalls at a higher airspeed than if flying straight.

HIGH ALTITUDE FLYING - Start the plane in flight at a high altitude. Notice the difference in top speed, in stalling speed, in power at full throttle, and in handling. Try a landing at 10,000 feet (set ground level to 10,000 and altitude to 11,000). Notice how rate of climb is affected and how the plane is more sensitive to turbulence.

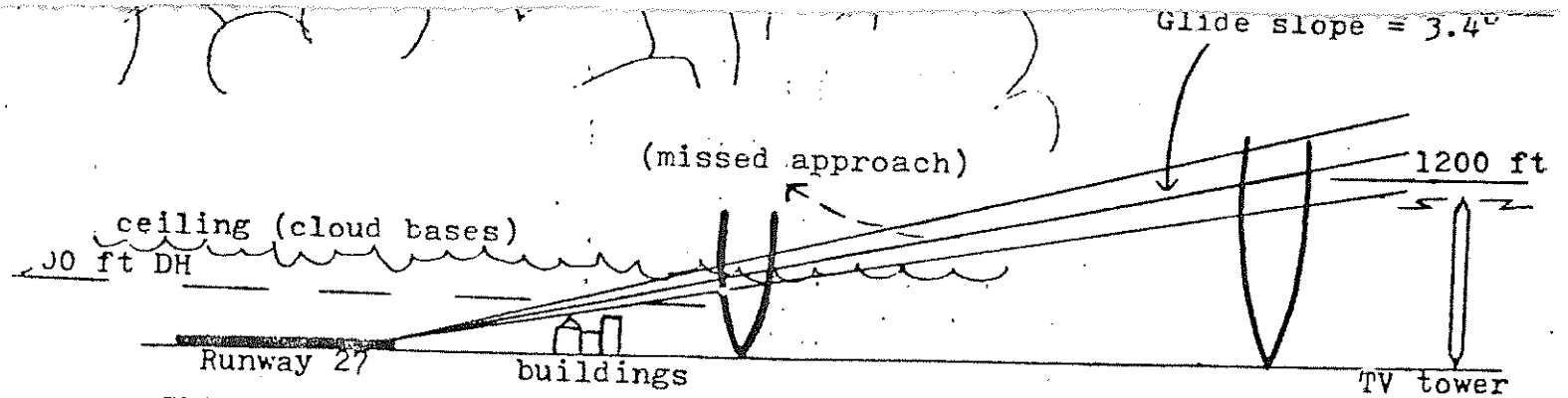
BEHIND THE POWER CURVE - Figure 6 shows the amount of power required for level flight at sea level at various speeds. When flying at low speeds, the only way to go slower is to apply more power (unless you can descend). If you have no more power and cannot go down, being behind the power curve is very dangerous because you cannot go faster (no power), you cannot go slower (no power), and you cannot go up (no power). You can't even turn (because this requires more lift). The only solution is to go down enough to get more speed so that you can then go even faster or else climb a little.

TAKE A TRIP - Map out a route that starts at the airport and returns there. For example, take off, fly west 5 minutes, then north 5, then southeast. You should return to the field. Try it with some wind. If you track outbound from the VOR you can guess what the wind is and try to allow for it when flying by "dead reckoning" (that is, not tracking on the VOR).

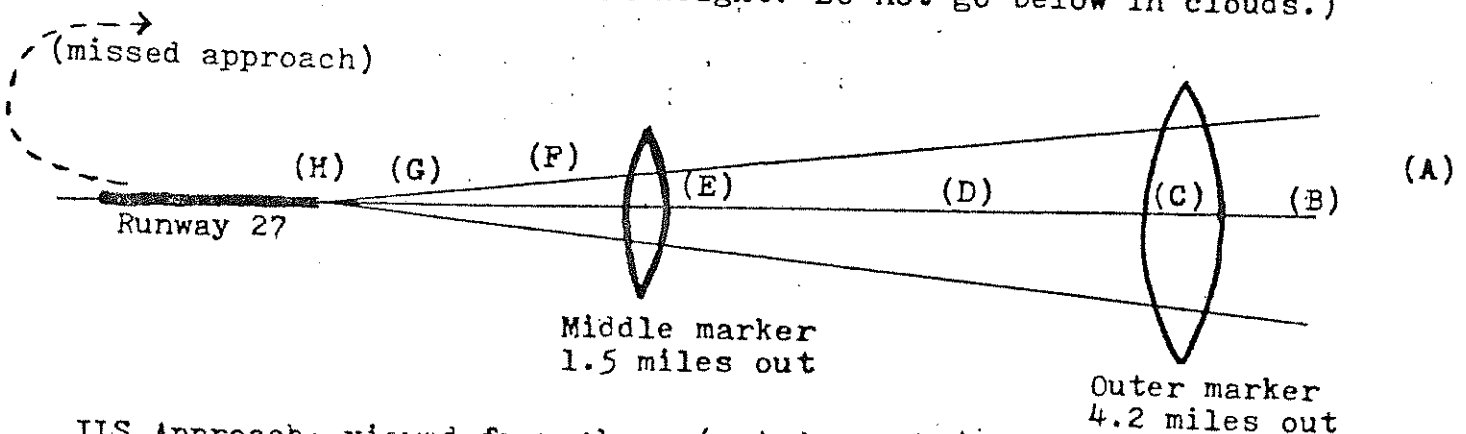
PROCEDURE TURN - When not being "vectored" by an approach controller, it is sometimes necessary to turn 180° preparatory to making an approach. Figure 7 shows how.



MKR:al
are of
AS:85m
AH:nos
down,
bank
right
ALT:35
NAV:"t
bearin
270°,
course
is to
right
TURN:t
right
DG:090
VS:300
fpm do
GAS:lef
tank le
than
right,
right
selecte
TACH:6C
FLAPS:u



ILS Approach: viewed from side (not to scale)
(DH = decision height. Do not go below in clouds.)



ILS Approach: viewed from above (not to scale)
(Letters in parentheces refer to explanation in OPTIONS section.)

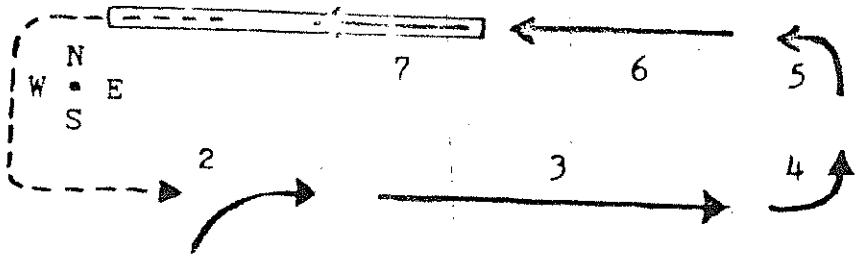
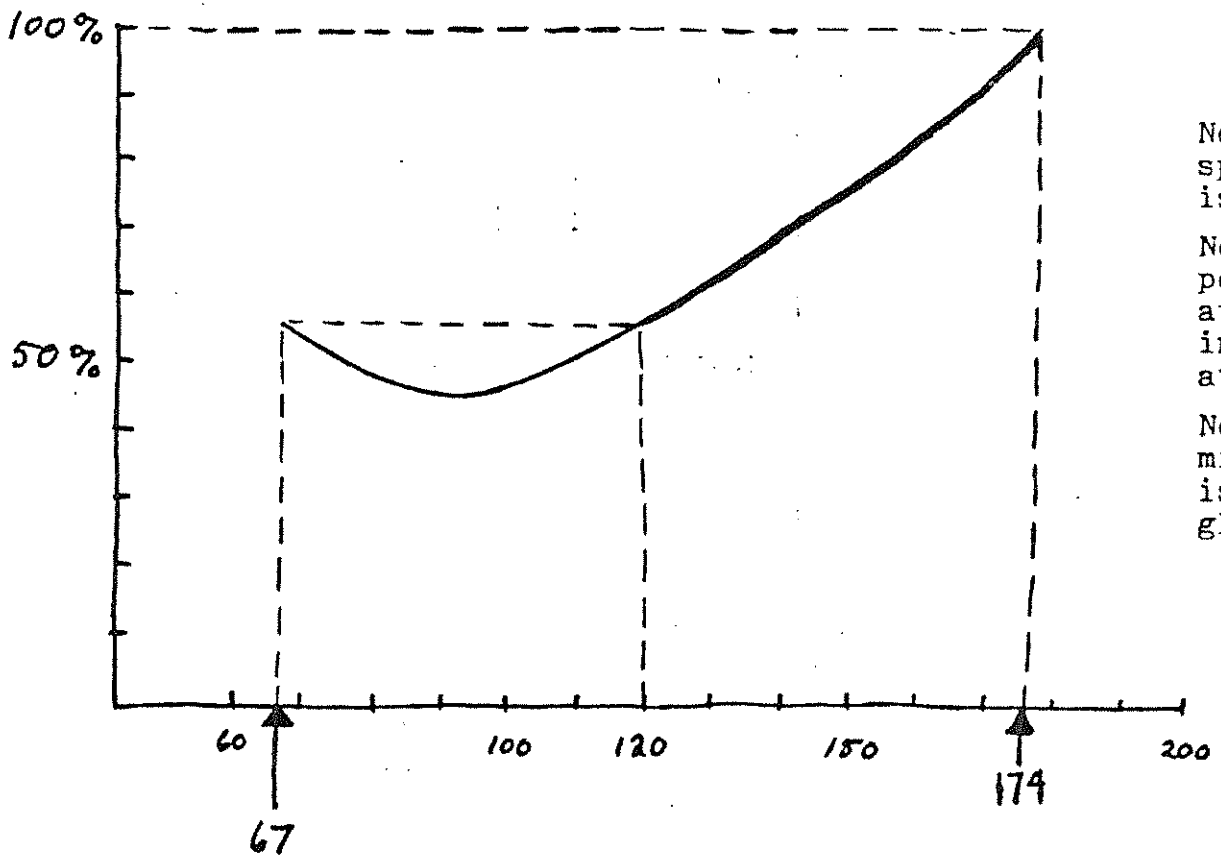


Figure 2: Landing

1) Initial position: about to join landing pattern. Heading 045, altitude 1000 ft.
2) Turn "down wind". Heading 090, altitude 1000 ft.
3) On down wind leg, slow down to approach speed. Lower flaps if desired. Heading 090, alt 1000 ft.
4) Start descent at or before this point, turn to "base" leg. Heading 360, altitude: descending.
5) Continue descent, turn from base to "final". Heading 270, altitude: descending.
6) Continue descent, get lined up with runway. Control descent to touchdown shortly after passing threshold
7) "Flare" to touchdown softly enough: pull back on stic and monitor power to control rate of descent. If a landing cannot be made of it because you lose contr or miss the runway, apply full power with the A key to climb back to pattern altitude and to circle to the left to make another attempt. (See dotted line.)



Note that max speed (174mph) is at 100% pwr

Note that same power is neede at 67mph (stal ing speed) as at 120mph.

Note that minimum pwr is near best glide speed (9

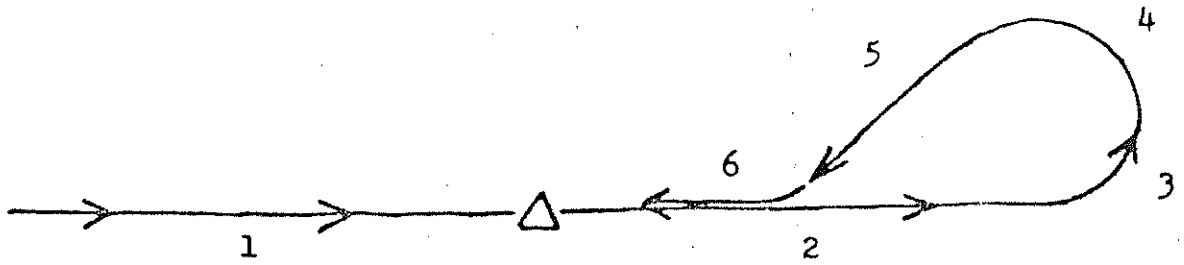


Figure 7: Procedure turn

1) Track inbound to the VOR
2) After crossing VOR, track outbound for 2 minutes.
3) Turn left 45°. (Fly straight 1 minute if desired.)
4) Turn left 180°.
5) Fly straight until intercepting inbound bearing. (Use I key to change from 090 to 270 first.)
6) Track inbound to VOR.

Note: All turns standard rate.

Try going east far enough to select an ILS approach.

GLOSSARY

Altimeter - measures height above sea level.
Artificial horizon - shows attitude of plane.
Attitude - whether nose is up or down, whether plane is banked.
Bank - Whether plane is tilted left or right.
Bearing - direction to or from ground station.
Best angle of climb - used to get maximum height in minimum distance, to clear obstacle.
Best L/D - best ratio of lift to drag, speed used for best glide distance.
Best rate of climb - used to get maximum height in minimum time.
Ceiling, absolute - altitude at which rate of climb is 0 fpm.
Ceiling, service - altitude at which rate of climb is 100 fpm.
Course - direction of ground track of plane. May differ from heading due to wind.
Decision height - on an ILS approach, the height below which you must not go unless the runway is in sight.
Flaps - section of trailing edge of wing which may be put down to increase both lift and drag. Used to clear obstacles on take off or landing.
G force - ratio of force acting on an object to force of gravity. For an airplane, ratio of lift to weight. Maximum G force wings can tolerate is 3.8 G's.
Glide slope - flat radio beam extending outward and upward at 3.4^{0} from horizontal from touch down point on the runway. Used by NAV radio to show pilot whether too high or too during ILS approach.
Heading - direction plane is pointed.
ILS - Instrument Landing System. For advanced pilots. Enables landing through cloud cover. Read INSTRUMENTATION AND